

1-05.5 CONSTRUCTION STAKES

Supplement the third paragraph of this section with the following:

4.

SECTION 2-03 ROADWAY EXCAVATION AND EMBANKMENT

2-03.3(19) BIORETENTION CELLS AND EARTH BERMS (New Section)

Bioretention cells and earth berms shall be constructed as shown on the Drawings.

2-03.3(19)A GRADING FOR BIORETENTION CELLS

The Contractor shall not start bioretention cell construction until the Project Site draining to the bioretention area has been stabilized and authorization is given by Engineer.

The Engineer will provide the Contractor with a Drawing indicating subgrade points that will be used to identify final grading prior to construction. Each Drawing will include horizontal and vertical control for bioretention cell construction.

All bioretention cells, conveyance swales, and associated drainage features shown on the Drawings shall be constructed to an accuracy of 0.25 feet in location and 0.08 feet in elevation unless otherwise noted. All other remaining drainage features shall be constructed to an accuracy of 0.50 feet for location and 0.17 feet for elevation.

Finish grades at all the subgrade points shall be reported to the Engineer for approval prior to the placement of bioretention soil or Type 26 aggregate and prior to subgrade soil scarification.

The Contractor shall scarify the subgrade soil to a minimum depth of 2 inches prior to placement of bioretention soil.

Following placement and compaction of the bioretention soil (see Section 7-21.3(2)), the Engineer shall verify the bioretention soil has been placed at a consistent uniform depth as specified on the Drawings.

Following placement of mulch, the Engineer shall verify the mulch has been placed at a consistent and uniform depth as specified on the Drawings.

Grading within root zones of existing trees to be protected shall be under the direction of the Engineer. Trees shall be protected per 1-07.16(2) and 8-02.3(7). Should grading conflict with existing Project Site conditions, the Contractor shall consult with the Engineer prior to proceeding with the Work.

No heavy equipment shall operate within the cell or earth berm perimeter during excavation, subsurface pipe placement, backfilling, tree pit preparation, or mulching.

Excavation within 6-inches of final native soil grade shall not be permitted if Project Site soil is frozen, has standing water, or has been subjected to more than ½ inch of precipitation within 48 hours..

No Materials or substances shall be mixed or dumped within the cell or earth berm area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations.

Relocation and/or adjustments of water meters shall be coordinated per Section 7-15 Water Service Connection Transfers.

Bioretention cells with a utility crossing through the swale soil or a side sewer within 18-inches from the bottom of the swale or rain garden soil shall require a clay trench dam to be constructed within

the existing utility trench to prevent migration of water along the utility service. A clay trench dam shall be placed and constructed at locations shown on the Drawings or as directed by the Engineer. Payment for cell liner will be made at the unit price bid for "Dam, Clay Trench".

Prior to finishing cell excavation, the Engineer will inspect swale native soil to establish if there are any soil lenses that might direct significant volumes of water to a private property or other area of concern. If such a soil lens is identified the Engineer shall determine if a swale liner is necessary.

Prior to placement of bioretention soil or type 26 aggregate in each cell, the Contractor shall notify the Engineer to inspect the bioretention cell. If any sediment laden runoff has entered the cell, the sediment deposition shall be removed by overexcavating the cell by a 3-inch minimum. An additional 3-inches of bioretention soil shall be imported at the Contractor's expense.

Prior to placement of bioretention soil in each cell when an underdrain is in place, the Contractor shall notify the Engineer to inspect the bioretention cell and top of underdrain bedding. If the bedding is not free of fines, the Contractor shall remove the top 6 inches and replace with material per design at the Contractor's expense.

Prior to placement of mulch in each cell, the Contractor shall notify the Engineer to inspect the bioretention cell. If any sediment laden runoff has entered the cell, the Contractor shall remove the top 3 inches of bioretention soil and replace with bioretention soil per design, at the Contractor's expense.

The finished elevation shall be flush with walks, curbs, pavements and driveways, unless adjacent to a bermed area, as verified by the Engineer. Upon completion of finish grading work, all excess Material shall be removed from the Project Site and disposed of accordingly.

2-03.3(19)B GRADING FOR EARTH BERM

The upper one foot of soil used for any bermed areas shall be turf bioretention soil, the lower portion of the berm shall be landscape bioretention soil (as defined in Section 7-21 Bioretention Soil) or native soil.

Finish grades at all the Grading Points shall be reported to the Engineer prior to the placement of mulch. Earth berm elevations shall meet the accuracy as described in Section 2-03.3(19)A. If design elevations are not met, the Engineer will require the Contractor to rework the soil to meet the design requirements, solely at the Contractor's expense. Following placement of mulch, the Engineer shall verify a consistent uniform mulch depth of 3-inches.

2-03.4 MEASUREMENT

Supplement this Section with the following:

No measurement for finish grading will be made.

2-03.5 PAYMENT

Supplement item 10. with the following:

Payment for Bioretention Cells & Earth Berms shall be made using the applicable bid items listed in the Bid Form.

No separate payment will be made for finish grading work required to hand grade Bioretention Cells and Earth Berms to final shape as specified.

No separate payment will be made for connection of private drain pipes to the cells.

7-21 NATURAL DRAINAGE SYSTEMS

Delete this Section and Title and replace with the following Section and Title:

7-21 BIORETENTION SOIL

7-21.1 DESCRIPTION

Section 7-21 describes work consisting of the installation of Bioretention Soil in bioretention cells intended to receive surface runoff for infiltration.

7-21.2 MATERIALS

Materials for bioretention soil will be specified in the Contract and consist of one or more of the following:

Landscape Bioretention Soil	9-14.1(3)B
Turf Bioretention Soil	9-14.1(3)C

7-21.3 CONSTRUCTION REQUIREMENTS

7-21.3(1) GENERAL

Bioretention soil shall be protected from all sources of additional moisture at the Supplier's site, in covered conveyance, and at the Project Site until incorporated into the Work. Soil placement and compaction shall not occur when the ground is frozen or excessively wet (3% above optimum moisture content), or when the weather is too wet as determined by the Engineer.

When the Contract specifies testing by a Contractor provided testing laboratory, the laboratory must be an STA, AASHTO or ASTM or other designated recognized standards organization accredited laboratory with current and maintained certification. The testing laboratory shall be capable of performing all tests to the standards specified, and shall provide test results with an accompanying Manufacturer's Certificate of Compliance.

7-21.3(1)A SUBMITTALS

At least 10 Working Days prior to placement of Bioretention Soil, the Contractor shall submit to the Engineer and the SPU Materials Laboratory, (insert address), for approval:

1. Grain size analysis results of Mineral Aggregate performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils;
2. Quality analysis results for compost performed in accordance with Seal of Testing Assurance (STA) standards, as specified in Section 9-14.4(9);
3. Organic content test results of mixed bioretention soil. Organic content test shall be performed in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) 05.07A, "Loss-On-Ignition Organic Matter Method";
4. Modified Proctor compaction testing of mixed bioretention soil, performed in accordance with ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort;
5. A description of the equipment and methods to mix the Mineral Aggregate and compost to produce bioretention soil;
6. Permeability or hydraulic conductivity testing of the bioretention soil, performed in accordance with ASTM D 2434, Standard Test Method for Permeability of Granular Soils. For the landscape bioretention soil assume a relative compaction of 85 percent of modified maximum dry density (ASTM D 1557); and

7. Provide the following information about the testing laboratory(ies):
 1. name of laboratory(ies) including contact person(s),
 2. address(es),
 3. phone contact(s),
 4. e-mail address(es);
 5. qualifications of laboratory and personnel including date of current certification by STA, ASTM, AASHTO, or approved equal.

7-21.3(2) BIORETENTION SOIL PLACEMENT

The Contractor shall not place bioretention soil until the Project Site draining to the bioretention area has been stabilized and authorization is given by Engineer.

Mixing or placing bioretention soil shall not be allowed if the area receiving bioretention soil is wet or saturated or has been subjected to more than ½-inch of precipitation within 48-hours prior to mixing or placement. The Engineer will have final authority to determine if wet or saturated conditions exist.

Place landscape bioretention soil loosely. Final soil depth shall be measured and verified only after the soil has been water compacted, which requires filling the cell with water, without creating any scour or erosion, to at least 1 inches of ponding. If water compaction is not an option, final soil depth shall be measured at X inches above the grade specified on the plans to allow for settling after the first storm. X shall be calculated by depth of soil x 0.15 and rounded up to the nearest whole number.

Place turf bioretention soil in loose lifts not exceeding 12 inches. Compact turf bioretention soil to a relative compaction of 85 percent of modified maximum dry density (ASTM D 1557), where slopes allow, as determined by the Engineer. Where turf bioretention soil is placed in the 2-foot road shoulder, compact to a relative compaction of 90 percent of modified maximum dry density (ASTM D 1557). Final soil depth shall be measured and verified only after the soil has been compacted.

7-21.4 MEASUREMENT

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs here in this Section.

Measurement for bioretention soil placement will be by per cubic yard.

7-21.5 PAYMENT

Compensation for the cost necessary to complete the Work described in Section 7-21 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. "Bioretention Soil Placement" per cubic yard.

The Bid item price for "Bioretention Soil Placement" shall include all costs for the work necessary to furnish, place, compact, excavate, grade, shape, mix, and dispose of bioretention soil.

9-03.2 AGGREGATES FOR NATURAL DRAINAGE SYSTEMS

Delete this Section and Title and replace with the following Section and Title:

9-03.2 MINERAL AGGREGATES FOR BIORETENTION SOIL

9-03.2(1) GENERAL

Supplemental text to the 2008 edition of the Standard Specifications

Mineral Aggregate shall be free of wood, waste, coating, or any other deleterious material. All Mineral Aggregate passing the No. 200 sieve size shall be non-plastic.

9-03.2(2) MINERAL AGGREGATE FOR TURF AND LANDSCAPE BIORETENTION SOIL

Mineral Aggregate for turf and landscape bioretention soils shall be analyzed by an accredited lab using the sieve sizes noted below, and shall meet the following gradation:

Sieve Size	Percent Passing
1 inch	100
No. 4	60 - 100
No.10	40 - 100
No. 40	15 - 50
No. 200	2 - 5

Efforts should be made to have the Mineral Aggregate for turf and landscape bioretention soils meet the following gradation coefficients: Coefficient of Uniformity ($C_u = D_{60}/D_{10}$) equal to or greater than 6; and Coefficient of Curve ($C_c = D_{30}^2/D_{60}D_{10}$) greater than or equal to 1 and less than or equal to 3.

9-14.1(3) NATURAL DRAINAGE SYSTEM SOILS

Delete this Section and Title and replace with the following Section and Title:

9-14.1(3) BIORETENTION SOIL

9-14.1(3)A GENERAL

Bioretention soil shall be a well blended mixture of Mineral Aggregate and compost measured on a volume basis.

9-14.1(3)B LANDSCAPE BIORETENTION SOIL

Landscape bioretention soil shall consist of two parts compost (approximately 35 to 40 percent) by volume meeting the requirements of Section 9-14.4(9) and three parts Mineral Aggregate (approximately 60 to 65 percent), by volume meeting the requirements of Section 9-03.2(3). The mixture shall be well blended to produce a homogeneous mix. Organic matter content shall be 8 to 10 percent, with the final mix to be determined by the Engineer based on samples and test results submitted.

9-14.1(3)C TURF BIORETENTION SOIL

Turf bioretention soil shall consist of one part compost by volume (approximately 30 to 35 percent), meeting the requirements of Section 9-14.4(9) and two parts mineral aggregate (approximately 65 to 70 percent) by volume meeting the requirements of Section 9-03.2(3). The mixture shall be well blended to produce a homogeneous mix. Organic matter content shall be 4 to 6 percent, with the final mix to be determined by the Engineer based on samples and test results submitted.

9-14.4(9) COMPOSTED MATERIAL

Delete this Section and replace with the following:

Compost products shall be the result of the biological degradation and transformation of Type I or III feedstocks under controlled conditions designed to promote aerobic decomposition, per WAC 173-350-220, which is available at <http://www.ecy.wa.gov/programs/swfa/compost>. Compost shall be stable with regard to oxygen consumption and carbon dioxide generation. Compost shall be mature with regard to its suitability for serving as a soil amendment or an erosion control BMP as defined below. The compost shall have a moisture content that has no visible free water or dust produced when handling the material.

Supplemental text to the 2008 edition of the Standard Specifications

Compost production and quality shall comply with Chapter 173-350 WAC, and meet the following physical criteria:

1. Compost material shall be tested in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) Test Method 02.02-B, "Sample Sieving for Aggregate Size Classification".

Compost shall meet the following:

	Min.	Max.
Percent passing 1"	99%	100%
Percent passing 5/8"	90%	100%
Percent passing 1/4"	40%	90%

2. The pH shall be between 5.5 and 8.0 when tested in accordance with TMECC 04.11-A, "1:5 Slurry pH".
3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight as determined by TMECC 03.08-A "percent dry weight basis".
4. Organic matter content should be between 45 and 65 percent dry weight basis as determined by TMECC 05.07A, "Loss-On-Ignition Organic Matter Method".
5. Soluble salt contents shall be less than 6.0 mmhos/cm tested in accordance with TMECC 04.10-A, "1:5 Slurry Method, Mass Basis".
6. Maturity shall be greater than 80% in accordance with TMECC 05.05-A, "Germination and Vigor".
7. Stability shall be 7 or below in accordance with TMECC 05.08-B, Carbon Dioxide Evolution Rate".
8. The compost product must originate a minimum of 65 percent by volume from recycled plant waste as defined in WAC 173-350-100 as "Type 1 Feedstocks." A maximum of 35 percent by volume of other approved organic waste as defined in WAC 173-350-100 as "Type III", including post-consumer food waste, but not including biosolids, may be substituted for recycled plant waste. The supplier shall provide written verification of feedstock sources.
9. Carbon to nitrogen ratio shall be less than 25:1 as determined using TMECC 04.01 "Total Carbon" and TMECC 04.02D "Total Kjeldhal Nitrogen". The Engineer may specify a C:N ratio up to 35:1 for projects where the plants selected are entirely Puget Sound native species.
10. The Engineer may also evaluate compost for maturity using the Solvita Compost Maturity Test at time of delivery. Compost shall score a number 6 or above on the Solvita Compost Maturity Test.

The compost supplier shall test all compost products within 90 Calendar Days prior to application. Samples shall be collected using the Seal of Testing Assurance (STA) sample collection protocol. The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741 Phone: 631-737-4931, www.compostingcouncil.org. The sample shall be sent to an independent STA Program approved laboratory. The compost supplier shall pay for the test. A copy of the approved independent STA Program laboratory test report shall be submitted to the Engineer prior to initial application of the compost. Seven days prior to application, the Contractor shall submit a sample of each type of compost to be used on the project to the Engineer.

Supplemental text to the 2008 edition of the Standard Specifications

Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Owner.

The Contractor shall submit the following information to the Engineer for approval:

1. A copy of the Solid Waste Handling Permit issued to the supplier by the Jurisdictional Health Department as per WAC 173-350 (Minimum Functional Standards for Solid Waste Handling).
2. The supplier shall verify in writing, and provide lab analyses that the Materials comply with the processes, testing, and standards specified in WAC 173-350 and these Specifications. An independent STA Program certified laboratory shall perform the analysis.
3. A list of the feedstock by percentage present in the final compost product.
4. A copy of the producer's STA certification as issued by the U.S. Composting Council.

Acceptance shall be based upon a satisfactory Test Report from an independent STA program certified laboratory and the sample(s) submitted to the Engineer.